

ORNL MVST Sludge (SL) Solidification Project Overview

NTS-RWAP Presentation

April 2009

Project Chronological Summary

- Original sludge processing approach was to use a thermal drying method.
- An operability review (1Q FY 07) identified high risk in the areas of cost, schedule, and worker safety for the base approach of thermal drying and powder handling.
- A lower cost and lower risk dewatering alternative was identified.
- A follow on feasibility study was initiated by EnergyX to evaluate another alternative, the solidification alternative.
- Solidification was evaluated, reviewed, and recommended as the preferred alternative with the greatest potential for success of the three alternatives.
- Conceptual Design Underway

Major Milestones (Baseline)

- SL Physical Build-out Complete
5/1/12
- SL Functional/Surrogate Testing Complete
8/31/12
- SL Hot Operations Start Up
2/1/13
- SL Processing Complete
9/30/18

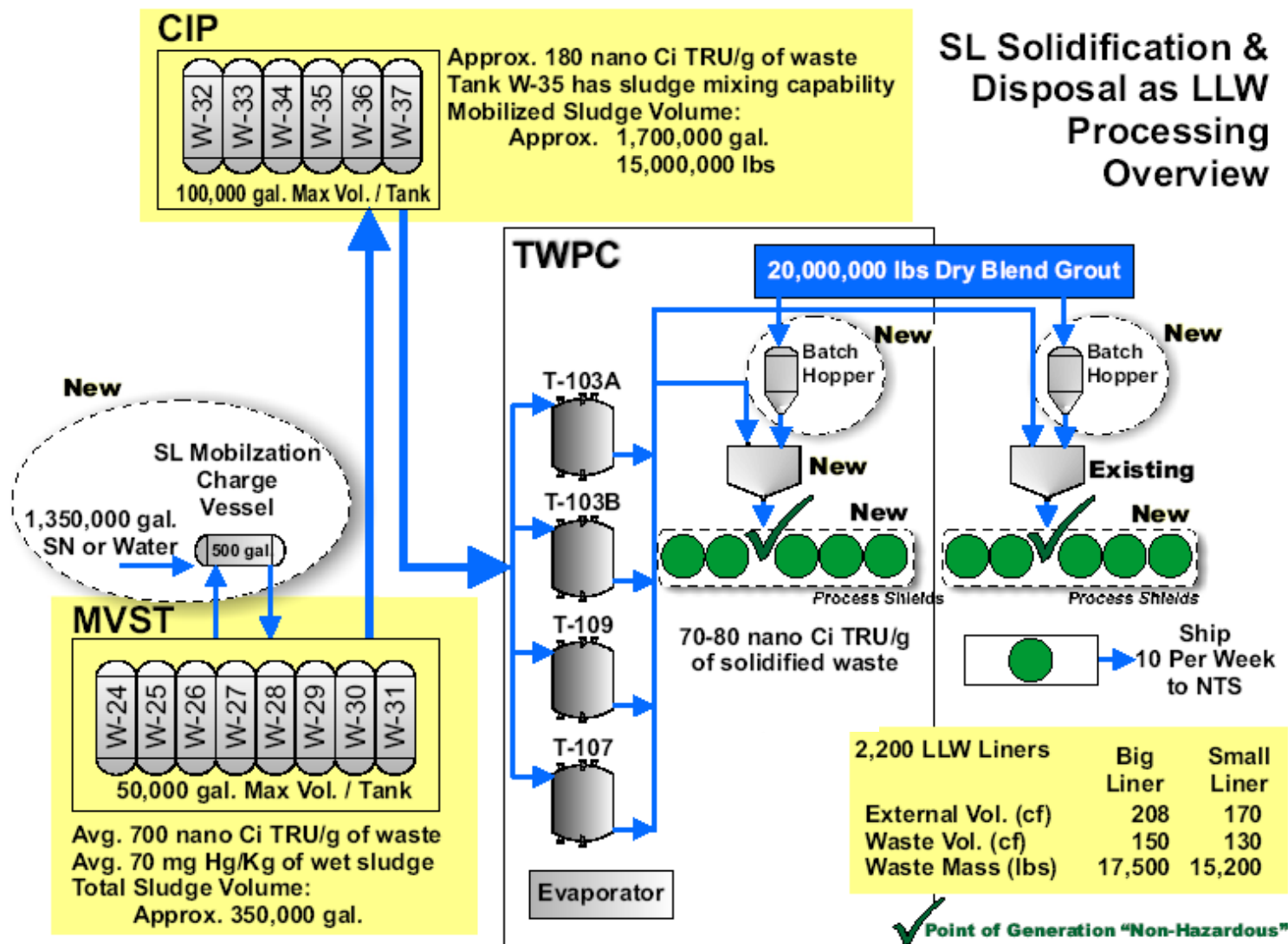
Process Sequence Summary

- Utilize SN or make-up water to mobilize and fluidize the SL.
- Transfer mobilized SL to the CIP tank with new SL handling capabilities.
- Homogenize, sample, analyze, and characterize.
- Transfer the mobilized SL to the TWPC.
- Pump SL to the mixer, add dry blend grout, mix, into a LLW liner.
- Transfer LLW liners from the process shields into shipping casks.
- Ship the LLW Liners (i.e., “monolith”), as LLW, to NTS.

TRU Waste Processing Center

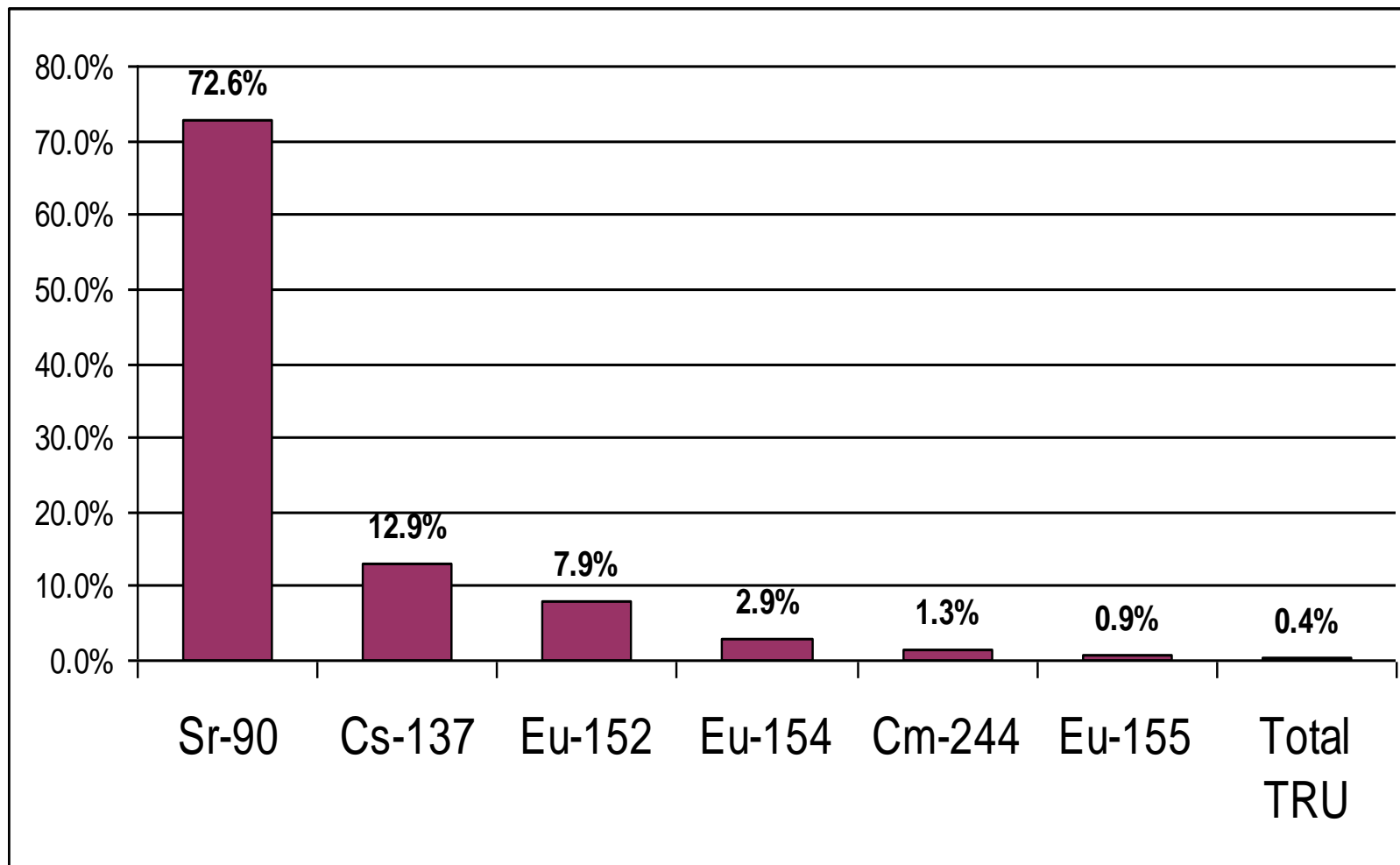


SL Solidification & Disposal as LLW Processing Overview

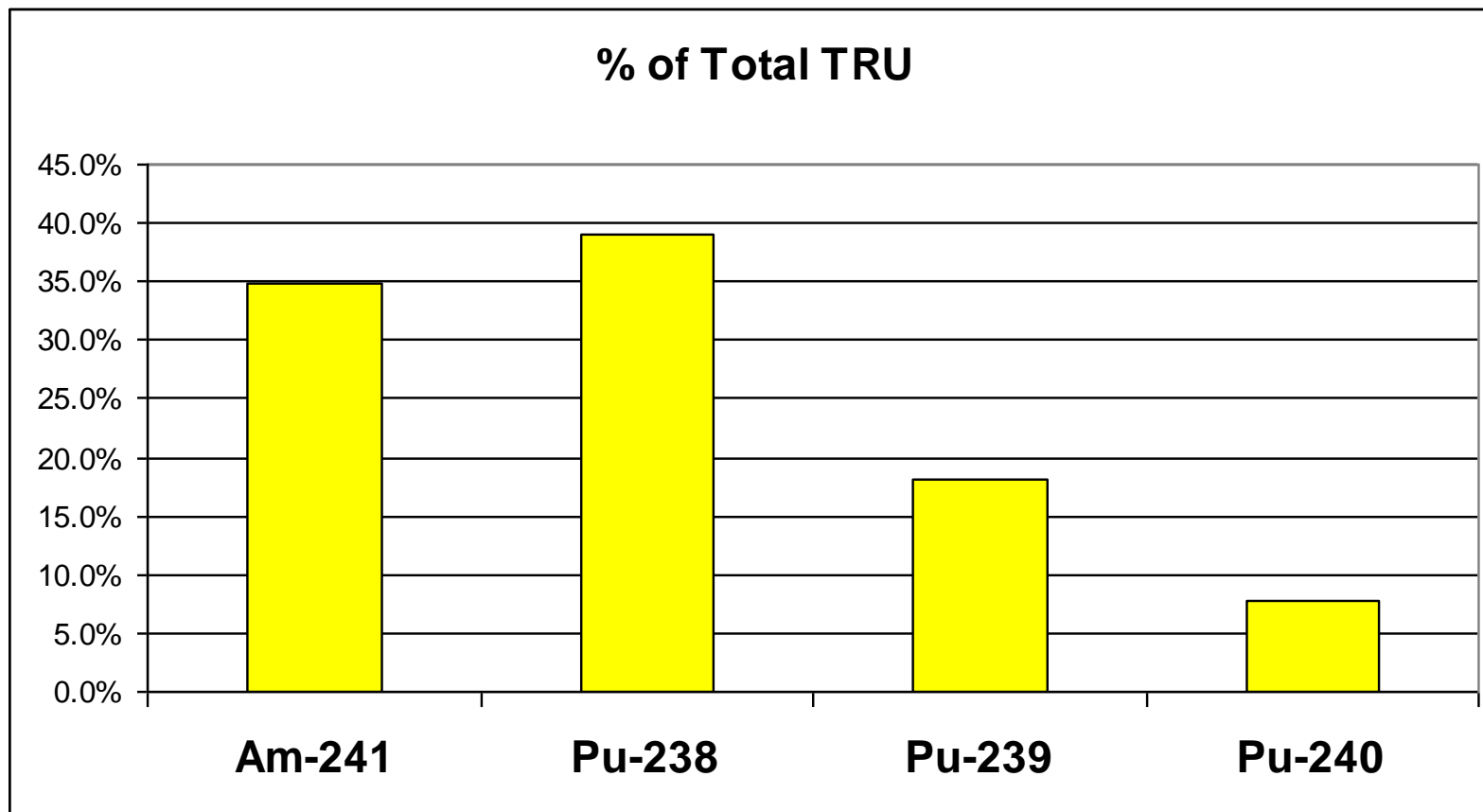


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MVST/BVST Radionuclide Distribution



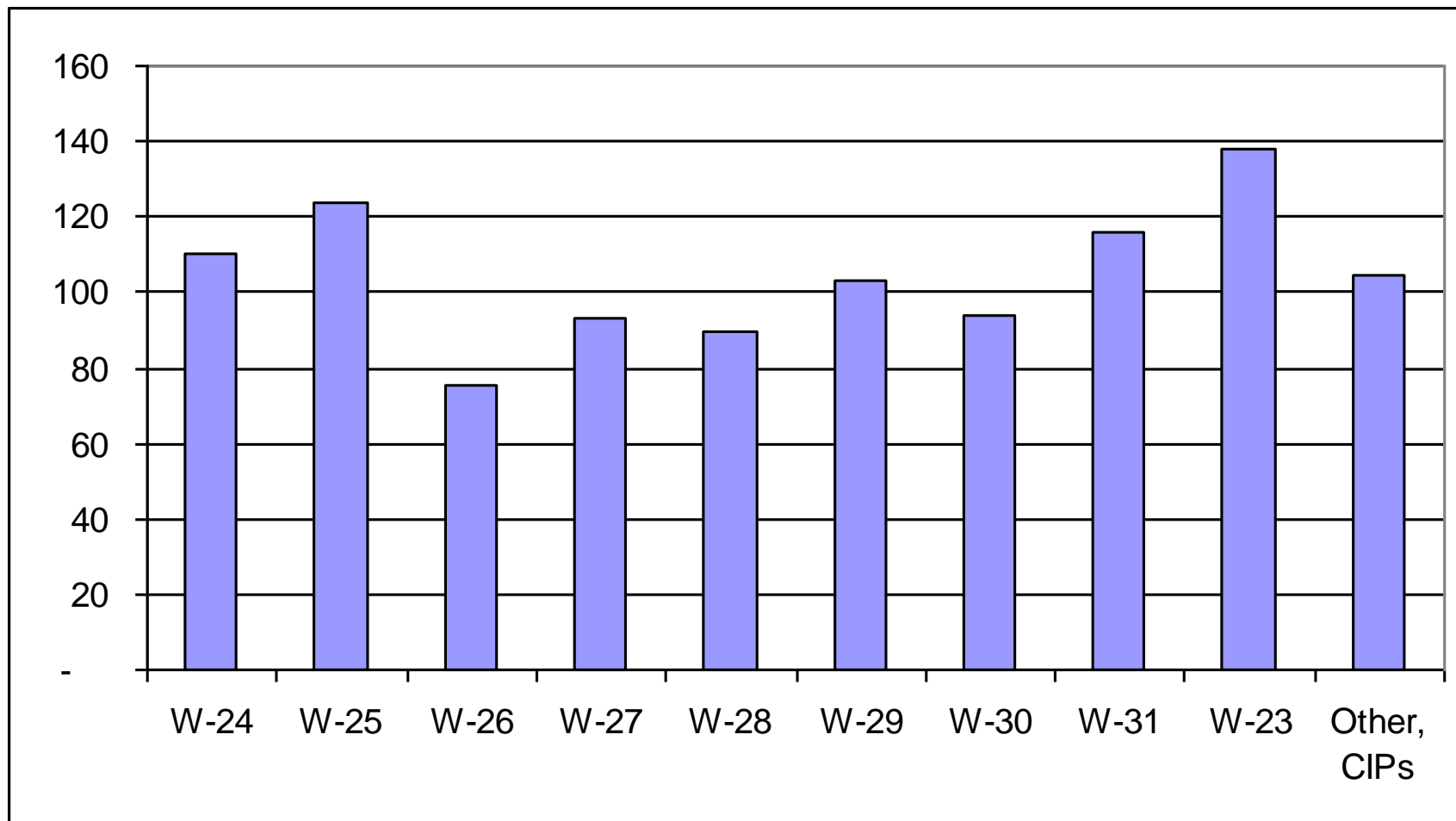
MVST/BVST Breakdown of TRU Radionuclides



Process Risk

- Lowest process risk
- Solidification is a mature and established technology
- Uses existing reliable SN equipment, with minor modifications, and additional simple material handling equipment & shielding

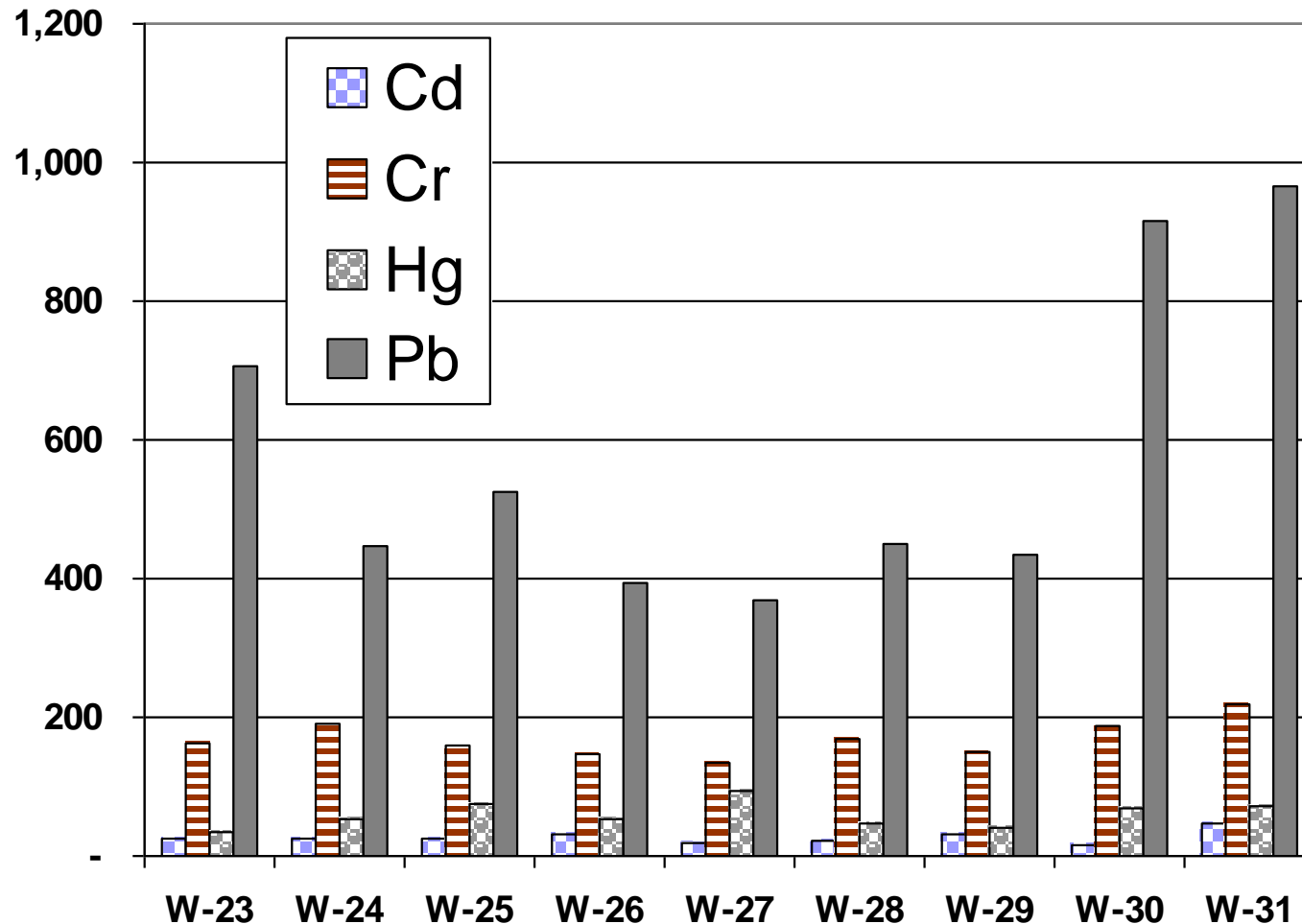
TRU Curies in MVST/BVST Tanks



Sampling/Analytical

- MVST Sludge is well characterized
- Newer 2001 Keller Report on sample results correlates well with Bayne statistical analysis of historical data

Avg. Top 4 RCRA Metals per Tank (mg/Kg)



Transportation

- DOT required shipping package
 - Readily available from commercial container companies
- Conveyance will require overweight permit
 - Will not exceed maximum allowable gross weight

ALARA/Criticality

- Lowest dose rates on final form
 - Lower than SN campaign at NTS
- Negligible incremental airborne contamination risk vs. SN, lower airborne risk than dewatering
- Criticality remains incredible
- Lowest collective worker exposure

Certification Risk

- Lowest risk
- Strong TWPC track record with NTS during SN and LLW campaigns
- Simplified characterization and process control

Grout Recipe

- EnergX proprietary recipe confirmed by bench scale testing on actual MVST SL samples
- Original Dry blend similar to SRS Saltstone
 - 45% Fly Ash (Class F)
 - 45% Blast Furnace Slag (Grade 120)
 - 10% Portland Cement
- ORNL SN Monoliths used a blend of Portland cement, blast furnace slag, flyash, and fumed silica

Bleed Water Control

- Bleed water (free water above grout) can occur during curing at high waste loadings
- EnergX recipe has been verified to eliminate bleed water formation
- Multiple recipes with high dry blend to SL ratios have been tested to provide a wide operating envelop and high confidence.
- Process can add anhydrous sodium metasilicate into the grout or as a monolith “cap” via Metso addition system
- Pre-load LLW liners with absorbent (Metso preload utilized during SN)

Process Control Approach

- Each “process batch” will be characterized prior to solidification to ensure that the resulting monoliths will be LLW
- Confirmatory bench scale solidification testing to confirm recipe will produce a monolith with no free liquid
- Mass ratio control via SL metering and dry blend charging weigh hopper
- Visual observation (camera) of mixing and LLW filling to ensure grout consistency